Lubrication of Railway Motor Bearings

To insure a cool running bearing, it is important that a steady supply of lubricant be constantly fed into it. The source of supply must be a part of the motor, of sufficient capacity to last between inspection periods and so protected as to keep the supply free from dirt and grit.

Eight general methods of lubrication have been used:

1. **Grease**—Heavy grease stored in a box or cup over the bearing, that melts and runs on the journal as heat is developed by the friction of the bearings.
2. **Grease and Oil**—Same as 1, with the addition of an oil well located under the bearing, from which oil is fed up to the bearing by means of a felt wick.
3. **Oil and Rings**—Oil well located directly under the bearings, in which a small brass ring runs suspended on the journals, and carries the oil to the bearings.
4. **Oil and Waste**—Oil well below and to one side of bearing, packed with saturated waste which presses against the journal through a window.
5. **Vaseline Packed**—The entire bearing packed in vaseline. Used mostly in the case of anti-friction (ball and roller) bearings.
6. **Circulating Oil**—Where the oil is forced through the bearing by means of a small pump.
7. **Special Adaptions**—Small oil cups placed in the grease box, from which wicks are suspended down to the top of the journal.
8. **Joggle Type**—Where a grease cup is used as an oil well and a metal ball or pin is placed at the opening of the journal.

As 4 is the method of lubrication used in the modern railway motors, it is treated more in detail.

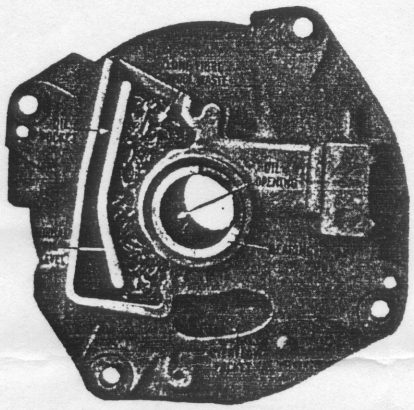

Fig. 1—Section Through Armature Housing

OIL AND WASTE LUBRICATION

Lubricant—Use a good grade of mineral oil, light oil in winter and heavy oil for summer use. Very good results have been obtained by special brands of prepared lubricants, which are highly recommended by some operators.

Waste—For best results use a long fibre wool waste. Before using, it should be saturated in oil for at least 24 hours, and left on a screen or grating to drain for several hours.

Oil Wells—These should be of ample capacity to hold sufficient oil to last between inspection periods, should have an accessible opening for inspection and refilling and should be provided with a tight fitting lid, held in place by a strong spring or bolts to keep out water, dirt or grit. Provision should be made for proper drainage of the spent oil and means provided to gauge depth of oil at regular inspection periods.

PACKING BEARINGS

Before the bearings are packed, all water, dirt, and small particles of metal should be removed from the oil well. Saturated waste should be loosely packed in the oil chamber and forced into place by a pronged rod of brass or some other soft metal, so that it will not injure the journal. In this manner pack the waste up over the bearing window, forcing it in place, so that its springy action tends to hold the waste against the journal.

INSPECTION AND OILING PERIODS

Well designed bearings of this type, if in good condition, properly packed with a long fibre wool waste, and when using a good grade of oil, should run from one to three weeks between oiling. This is determined largely by the system of inspection of the other equipment on the cars, which makes it advisable for each operator to work out in actual service the most suitable oiling schedule to fit the operating conditions of his equipment. When inspecting bearings, all dirt should be carefully wiped from the oil box lid before it is opened, after which the proper measure of oil should be poured into the oil well opening—not on top of the waste.

QUANTITY OF OIL

One to two gills of oil per bearing is required at each oiling period. This quantity varies with the size of motor and the location of the bearings, i. e., pinion end, commutator end, armature bearings or axle bearings. The quantity of oil also depends largely upon the length of time between oiling periods and the service conditions.

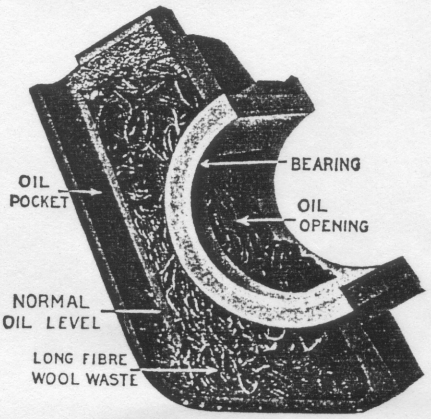

Fig. 2—Section Through Axle Cap

HEIGHT OF OIL

From Figs. 1 and 2 it can be seen that if too much oil is poured into the oil well, the level will rise above the bearing window and the oil will overflow into the motor. This is likely to injure the insulation, and further is a waste of oil. On the average the maximum height of oil in armature bearings for a 50 horsepower motor should be about 3.5 inches while the minimum should be 1 inch. For axle bearings the maximum should be 2.5 inches and the minimum ½ inch. These heights can be checked by a rod placed in the oil well.

REPACKING BEARINGS

It is considered good practice to repack the bearings every three months, at this time removing all the waste, discarding that which is glazed and charred, refilling the bearings with good, clean, old waste to which has been added sufficient new waste. About once a month it is advisable to "tease up" the waste in the bearings to make it more effective.

Precautions.

Use long fibre wool waste.
Use a clean oil.
Use waste that has been well saturated.
Keep oil and waste in closed cans.
Pour the oil in oil well.
See that oil box lids are kept closed.
Do not flood bearings with oil.
Keep waste teased up.

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Oil, Grease and Waste for Railway Motors and Gears

Hot bearings are, to a large extent, due to poor lubrication or to an inferior grade of lubricant. The fundamentals of correct lubrication are the use of the right lubricant, applied in the right way, and in the right amount. The amount and application of lubricant depend largely upon the design of the bearing and the service conditions.

OIL

Grade—Oils are either animal, vegetable or mineral. For railway work use a good grade of neutral mineral oil. It must be free from acid or alkali, either of which will corrode the bright surface of the metal.

Clean—The oil should be free from dirt and water. Water will reduce the lubricating value of the oil as it tends to wipe the oil from the journal. Particles of dirt and grit will increase the friction, and cause the bearings to heat up.

Fluidity—The oil should flow readily and be taken up and held by the waste. If it is too thin, the waste and bearing will rapidly drain the oil, and the bearings will soon run dry; thus, the oil must have enough body to cling to the waste and to be fed to the bearings as required. It should be heavy enough to furnish a supporting film between the journal and the bearing to sustain the load. For this reason a light or thin oil, should be used in winter and a heavy or thick oil in summer.

The Oil Should Not Gum as it will then clog up the lifting or wick action of the waste and tend to prevent the oil from entering between the journal and bearing surfaces.

Cost—Quality of oil should never be sacrificed to first cost. Tests to determine the quality and lubricating properties of an oil require an extensive laboratory equipment, hence to safeguard your interests always deal with reliable producers who have had years of experience and who have test facilities which permit them to guarantee the uniformity and reliability of their product.

SPECIAL LUBRICANTS

Specially prepared lubricants which are not entirely oils are used by some operating companies with very good results and are highly recommended.

GREASE

Uses—Grease is used in connection with the lubrication of some of the old type railway motor bearings and on all main motor gears and pinions. The same grade of grease selected for motor bearings can be used for the gears and pinions, but some special greases and compounds prepared for gears and pinions are not suitable for motor bearings, on account of their high melting point.

Grades—Grease consists of a fatty soap impregnated with a mineral oil. The solid part simply acts as a carrier for holding the oil in position, and has little value as a lubricant. Greases are usually graded according to their stiffness, which has an important bearing upon the ease with which they can be handled, and the service they will give. They are mostly graded from the softest to the hardest with numbers indicating their relative melting point. Thus a No. 1 grease is usually softer than a No. 2 grease, etc. A limesoap grease with a neutral reaction (which does not show any traces of an acid or an alkali) gives best results in service.

Clean—The grease should be free from dirt and grit and the percentage of wafer should be very low, as all of these will reduce the lubricating value and increase the heating of the bearing.

Melting Point—To insure its being retained in the bearing, the grease should have a melting point of 10 to 15 degrees C. above the normal operating temperature. If too hard, it will not flow readily and will increase bearing losses. On the other hand if the melting point is too low, it will not be retained in the bearing.

Cost—The same consideration referred to in connection with oil also applies to grease. In general, do not be misled by a highly colored or scented product with a fancy name and a correspondingly high price.

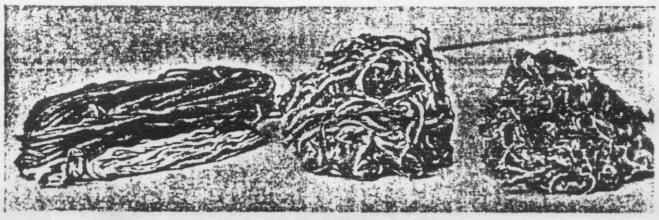
WASTE

Grades—Waste or packing is commonly made up of wool threads alone or wool and cotton threads mixed with a resilient mineral or fibre, such as asbestos, cocoa fibre, moss, etc.

Dirt and Moisture—Dirty particles are liable to be carried by the oil up to the bearing and work into the oil film. All waste contains some moisture, but if too much is present, you pay for water instead of waste.

Elasticity—Unless the waste is springy and elastic it will fall away from the bearing window, and thus cut off the supply of oil being fed to the journal. To secure this, it must be of the right grade of material, such as long wool threads or a mixture of wool threads, cotton threads, and a fibrous material. By proper machining, the material is intimately mixed and formed into a fleece with the threads all running in one direction.

Quality—Wool waste is commonly considered the best material as it is springy and elastic after being soaked in oil, and readily parts with the oil to the journal. However, its absorption property and wick action is not quite so good as that of cotton threads. Cotton threads are not springy, but absorb more oil than wool and have a better wick action. Some manufacturers consider a mixture of wool and cotton threads to give best results in service. A good packing should have the power of holding the correct quantity of oil evenly distributed through the threads of the waste, which should also be able to carry the oil by wick action against the force of gravity, if necessary, to the threads in contact with the journal.



Long Thread Wool | Shorter Thread Wool | Short Thread Cotton

Long Fibres are preferable as they carry the oil from the oil well to the bearing windows more satisfactorily than short strands, thus insuring a steady supply of oil. This is made possible by the wick action of the material when in a long continuous thread.

Special Preparations to make the waste springy and elastic are made up and used with fairly good results. They consist of various grades of wool and cotton thread mixed with horse hair or asbestos. Another brand is made by binding the waste in small bundles using a thin brass wire.

SUMMARY

1. Trade with reliable and experienced dealers.
2. In considering first cost, do not lose sight of final results. A few hot bearings may wipe out all initial first cost savings.
3. Lubricants that have given good results in service need no further recommendations.
4. Neglect is frequently responsible for troubles charged up against oil, grease, and waste.
5. Proper facilities for handling and storage should be provided.

Saturation of Motor Bearing Waste

The most common method of lubricating the bearings of a railway motor and the car journals is by means of oil and waste. To get the best results, the waste should be well saturated before it is packed in the oil wells. This is done by soaking the waste for a certain definite time in oil and then setting it aside to drain.

MATERIALS

The materials used for this work should be a clean, long fibre wool waste and a good reliable grade of neutral mineral car oil. Such waste will absorb about four times its weight of mineral oil.

METHOD OF HANDLING

The waste is placed in a closed can or tank of oil of the same grade as used to lubricate the bearings and left to soak for at least twenty-four hours. During this process, some companies apply heat, thus reducing the time required to saturate the waste. The waste is then lifted out of the oil and placed on a screen or grid and left to drain until all excess or extra oil has dripped off. This draining takes about twenty-four hours, after which the saturated waste is placed in closed cans ready to be packed in the oil wells.

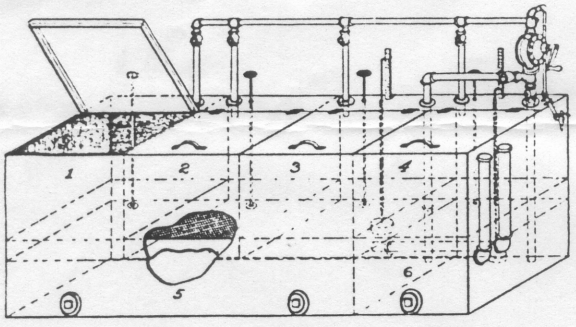


Fig. 1—Waste Saturating Tank for Railway Car Journal Lubrication

APPARATUS

A very convenient and efficient tank, designed for doing this work, is shown in Fig. 1. The dry waste is placed in sections 1, 2 and 3, and the fresh oil in section 5. By means of the pump on top of the tank, the oil from section 5 is lifted into chambers 1, 2 and 3, which are filled with waste. After the waste has thoroughly soaked for twenty-four hours, the oil is drained back into tank 5, from which it is used again. About twenty-four hours after the oil is drained off, the waste is ready for use. Chambers 4 and 6 are used to re-saturate old waste and the oil used for this work is kept separate from the new oil. Large cleanout plugs are provided for both oil chambers, which are also fitted with float gauges to indicate the amount of oil in them.

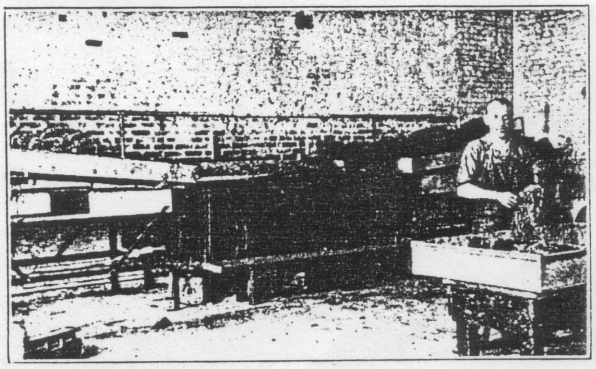


Fig. 2—New and Old Waste Saturating Tanks in Operation

A very simple and cheap tank can be made up with one or more chambers, having a screen or grid shelf about half way down, on which waste is placed to drain after being saturated. The dry waste is placed in a wire basket and immersed in the oil contained in the lower half of the tank. When thoroughly soaked, lift the basket onto the shelf and allow the oil to drain off.

SPECIAL APPARATUS

One large railway company has in operation a very successful tank which supplies waste for 1600 cars; this tank is shown in Fig. 2. This system consists of two tanks, approximately three feet wide, four feet long and two feet deep, with drain boards on either end. New waste is used in one tank for use in armature bearings and old waste for use in axle bearings and journal boxes is used in the other tank. The tanks are built of double wall construction, such that a hot water jacket can be used to keep the oil at an even temperature of approximately 120 degrees F. Each tank holds about 75 gallons of oil and 110 pounds of waste. The waste is left in the tanks three hours, after which it is removed and left upon the drain board several hours until ready to be placed in containers for transportation to one of the car barns.